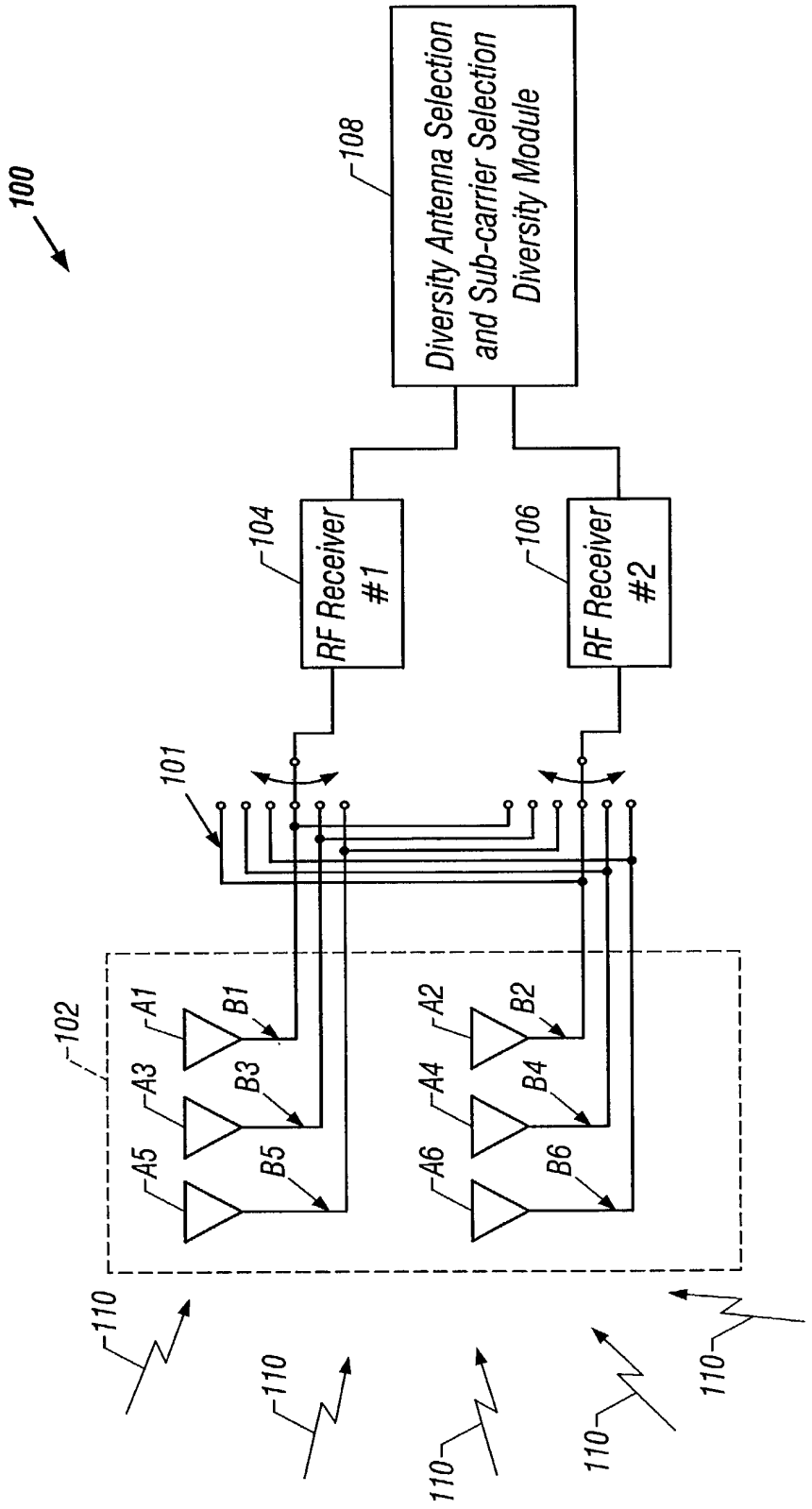
100
108
Diversity Antenna Selection and Sub-carrier Selection Diversity Module
104
RF Receiver #1
106
RF Receiver #2
101
102
A1
B1
A2
B2
A3
B3
A4
B4
A5
B5
A6
B6
110
110
110
110
110

FIG. 1

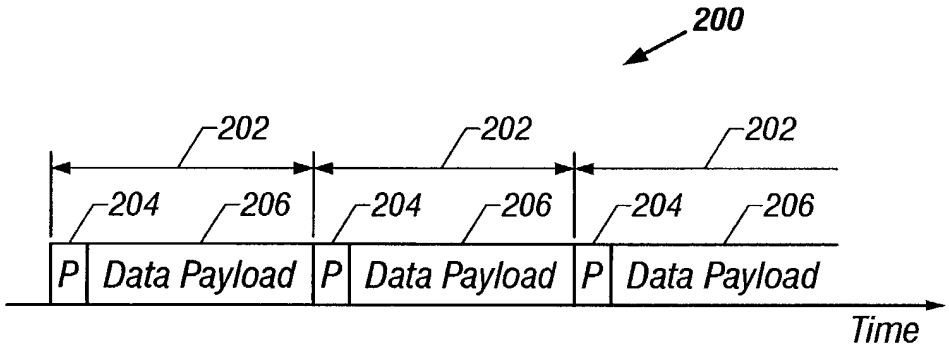

FIG. 2
(Prior Art)

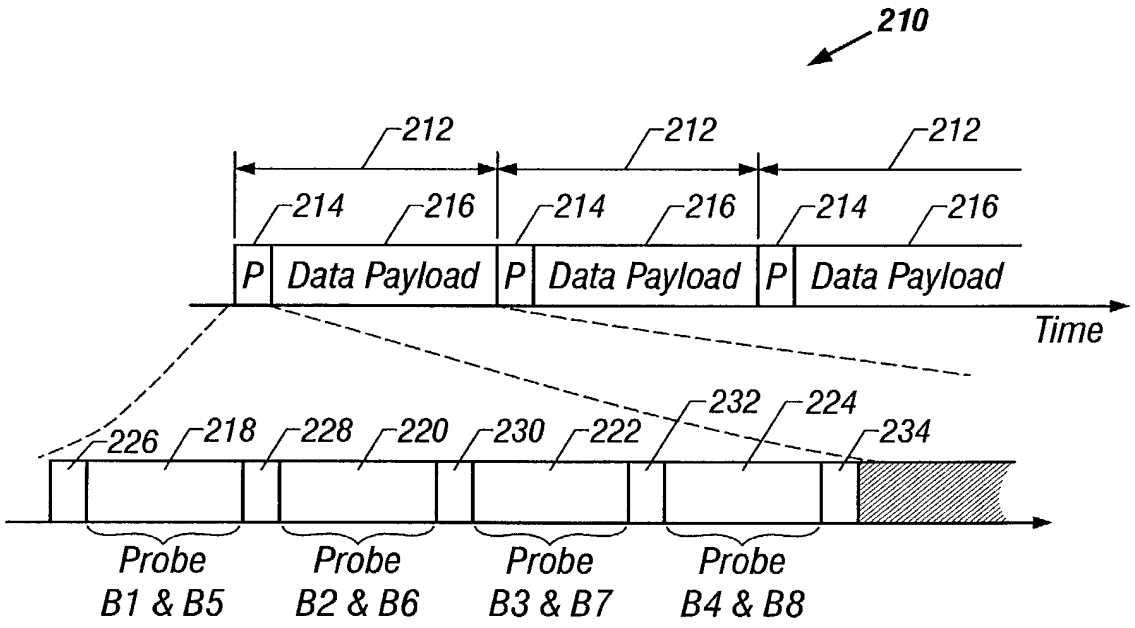

FIG. 3

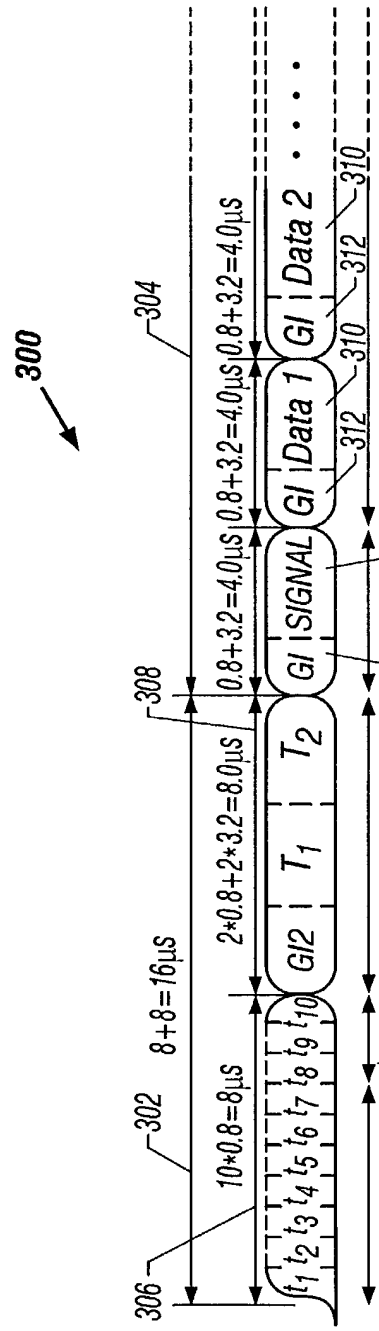

FIG. 4
(Prior Art)

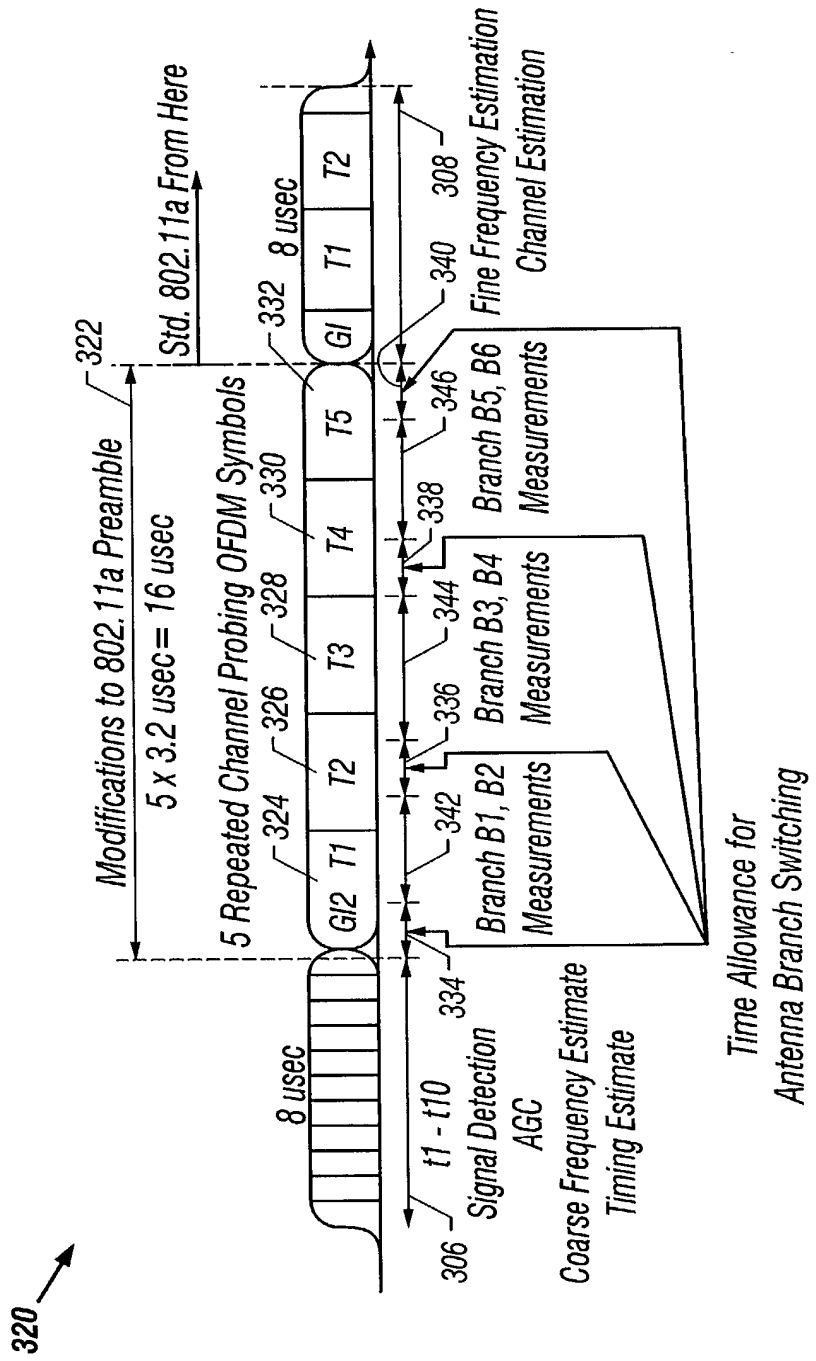
320
306
t1 - t10
Signal Detection
AGC
Coarse Frequency Estimate
Timing Estimate
334
8 usec
GI2 T1
T2
T3
T4
T5
GI
T1
T2
8 usec
5 Repeated Channel Probing OFDM Symbols
5 x 3.2 usec = 16 usec
Modifications to 802.11a Preamble
Std. 802.11a From Here
322
324
326
328
330
332
342
Branch B1, B2 Measurements
336
Branch B3, B4 Measurements
338
344
Branch B5, B6 Measurements
346
340
Fine Frequency Estimation
Channel Estimation
308
Time Allowance for Antenna Branch Switching

FIG. 5

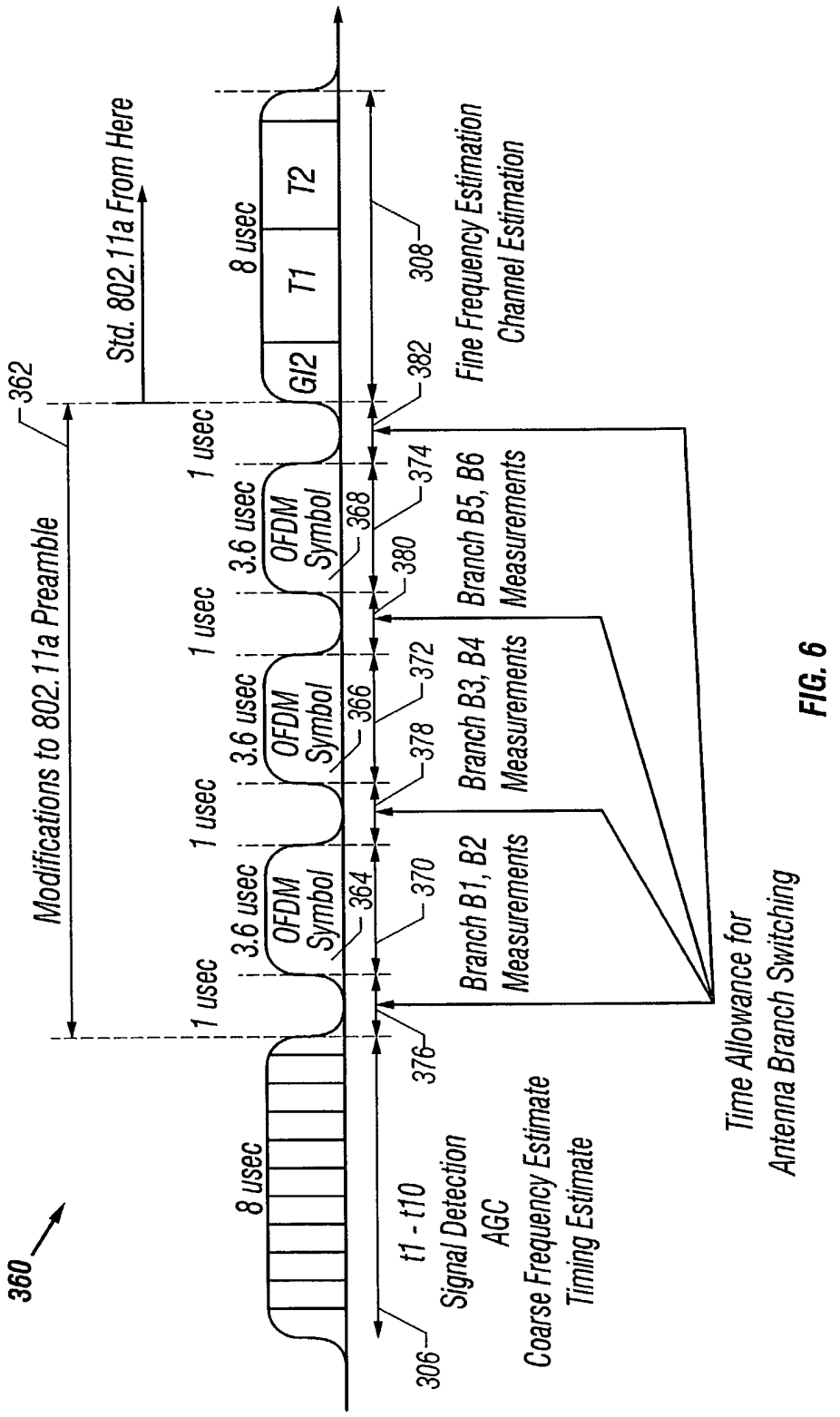
360
362
Std. 802.11a From Here
Modifications to 802.11a Preamble
8 usec
T1
T2
GI2
382
308
Fine Frequency Estimation
Channel Estimation
1 usec
3.6 usec
OFDM Symbol
374
368
380
Branch B5, B6 Measurements
372
366
378
Branch B3, B4 Measurements
370
364
Branch B1, B2 Measurements
376
306
t1 - t10
Signal Detection
AGC
Coarse Frequency Estimate
Timing Estimate
Time Allowance for Antenna Branch Switching

FIG. 6

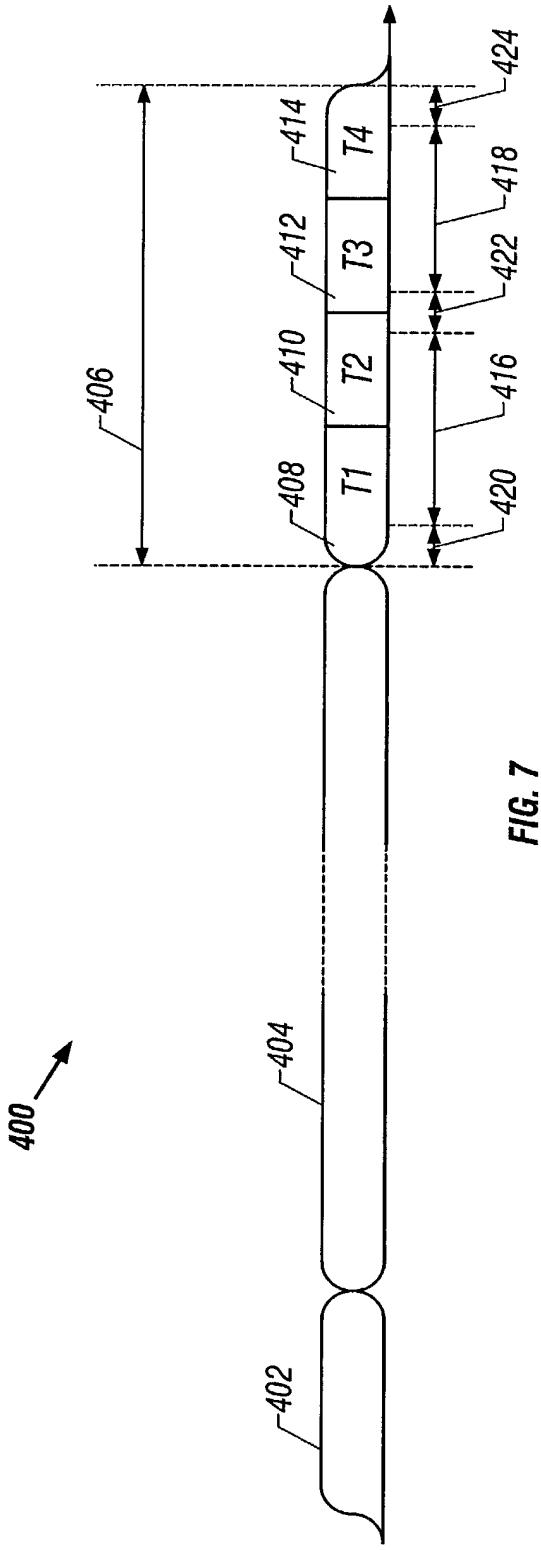

FIG. 7

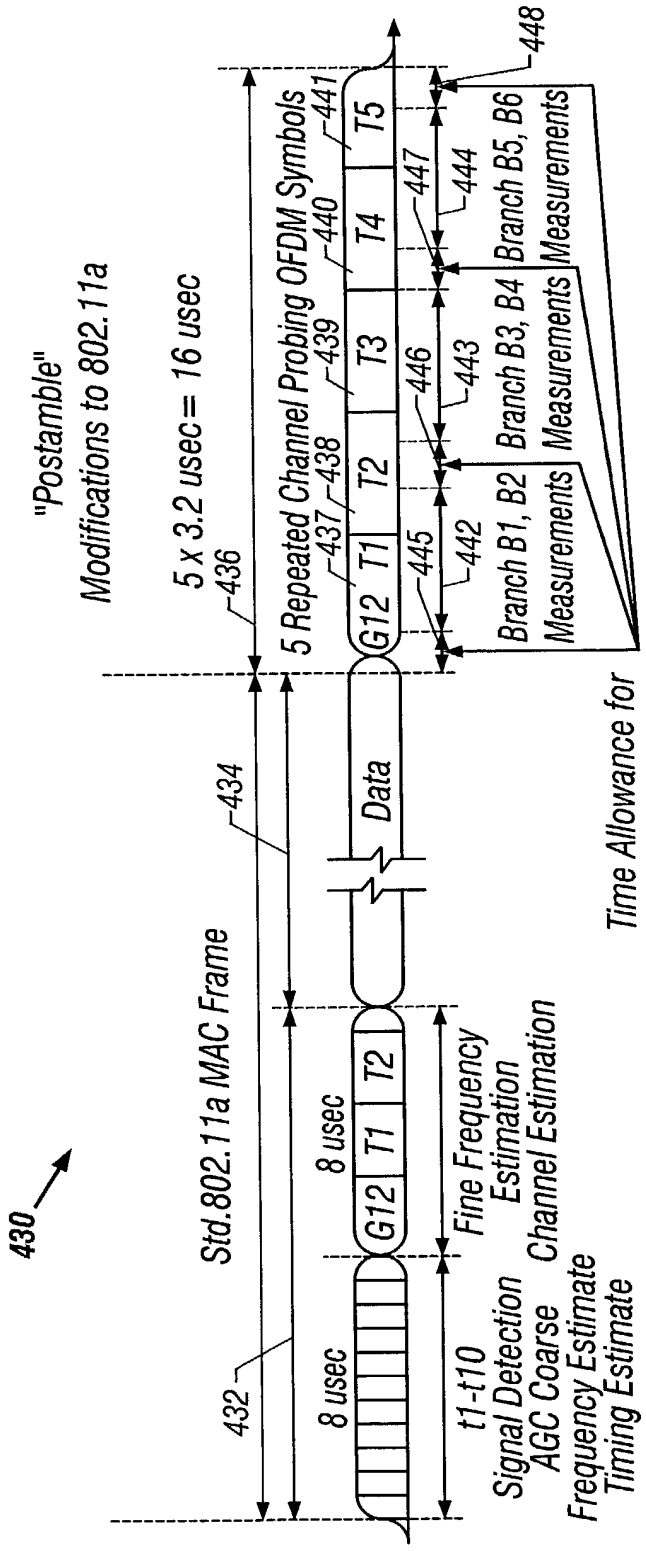
430
Std.802.11a MAC Frame
432
8 usec
G12
T1
T2
8 usec
t1-t10
Signal Detection
AGC Coarse
Frequency Estimate
Timing Estimate
Fine Frequency
Estimation
Channel Estimation
434
Data
"Postamble"
Modifications to 802.11a
5 x 3.2 usec = 16 usec
436
5 Repeated Channel Probing OFDM Symbols
437
438
439
440
441
G12
T1
T2
T3
T4
T5
442
443
444
445
446
447
448
Branch B1, B2
Measurements
Branch B3, B4
Measurements
Branch B5, B6
Measurements
Time Allowance for
Antenna Branch
Switching

FIG. 8

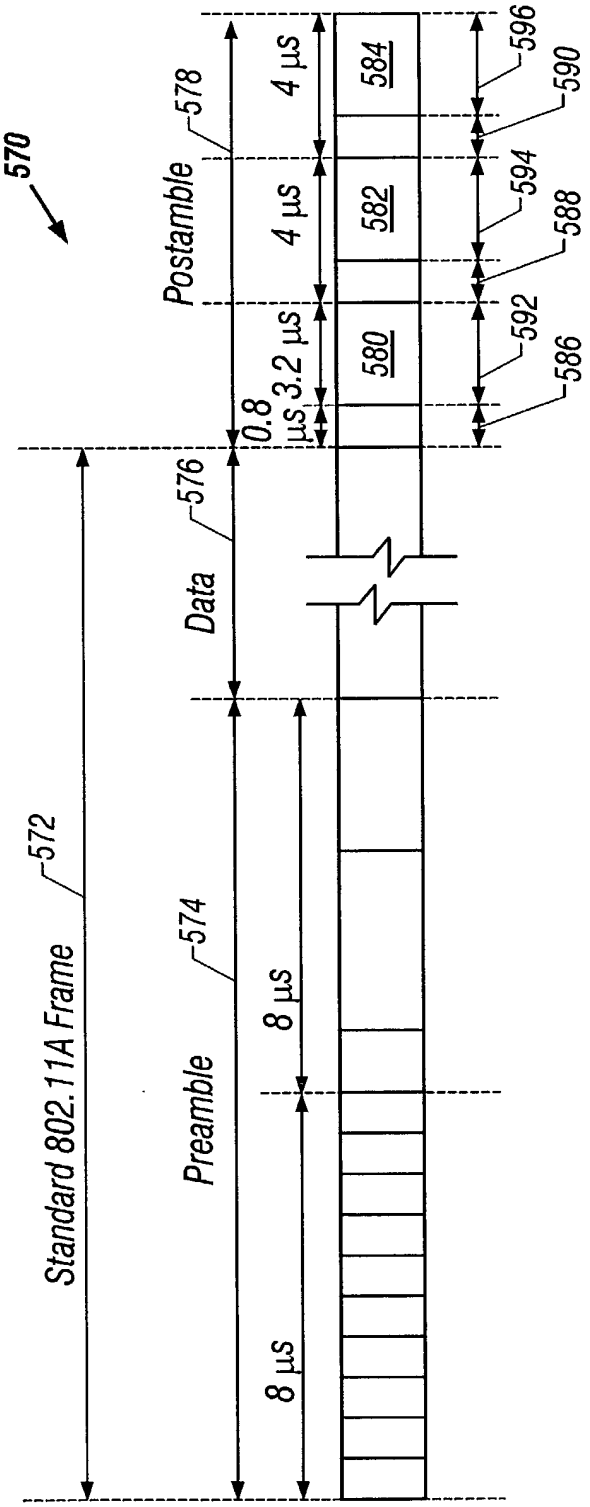
570
Postamble
578
4 µs
584
596
590
4 µs
582
594
588
3.2 µs
580
592
586
0.8 µs
576
Data
572
Standard 802.11A Frame
574
Preamble
8 µs
8 µs

FIG. 9

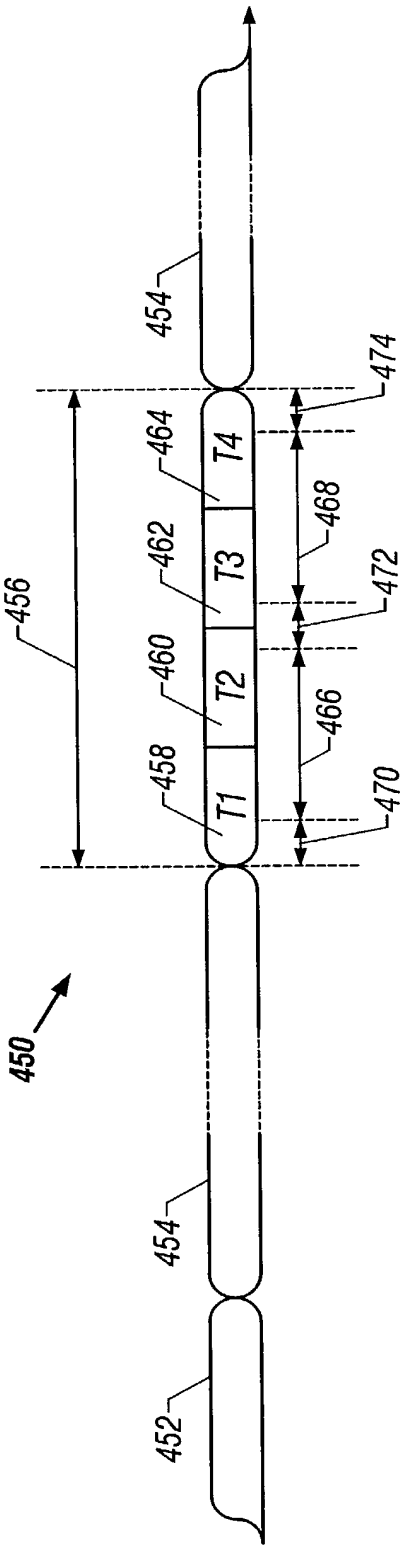
454
474
464
T4
468
462
T3
472
456
460
T2
466
458
T1
470
450
454
452

FIG. 10

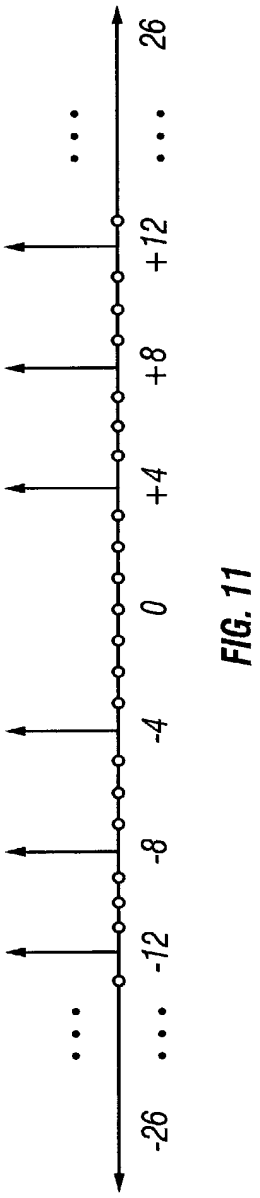

FIG. 11

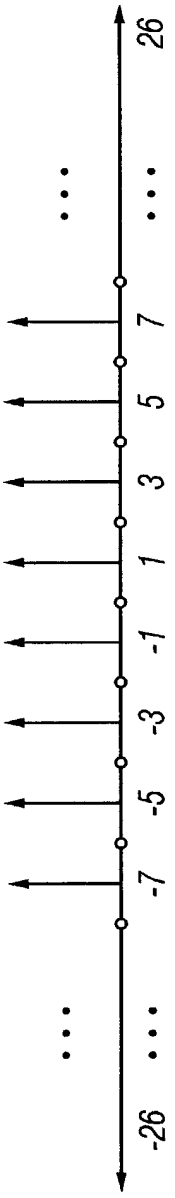

FIG. 12

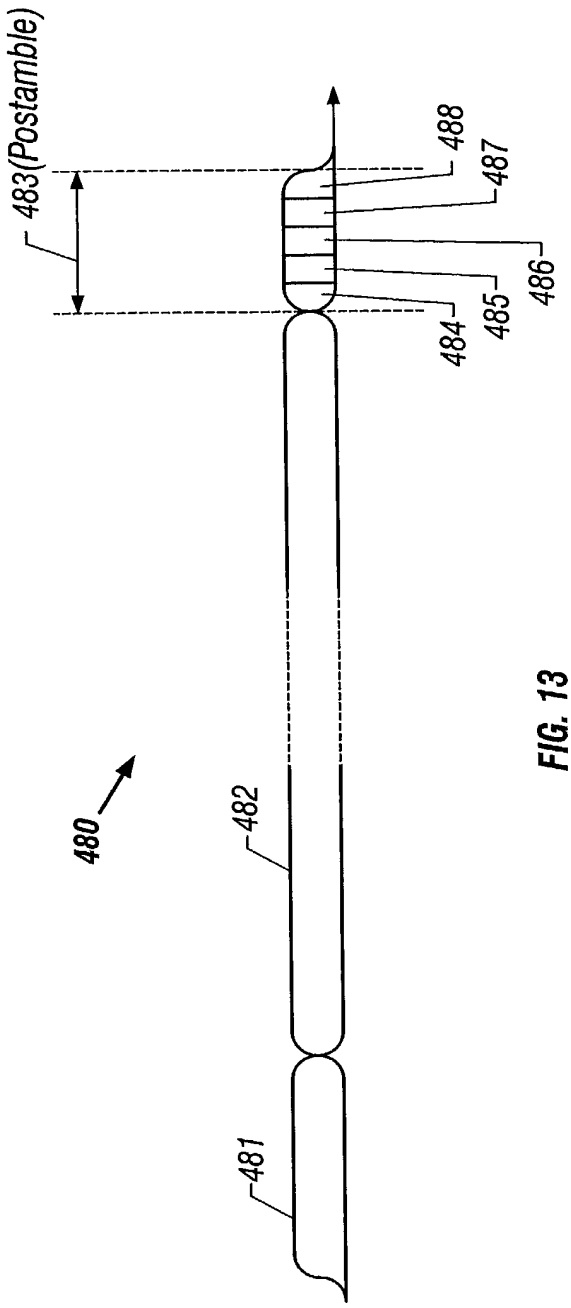

FIG. 13

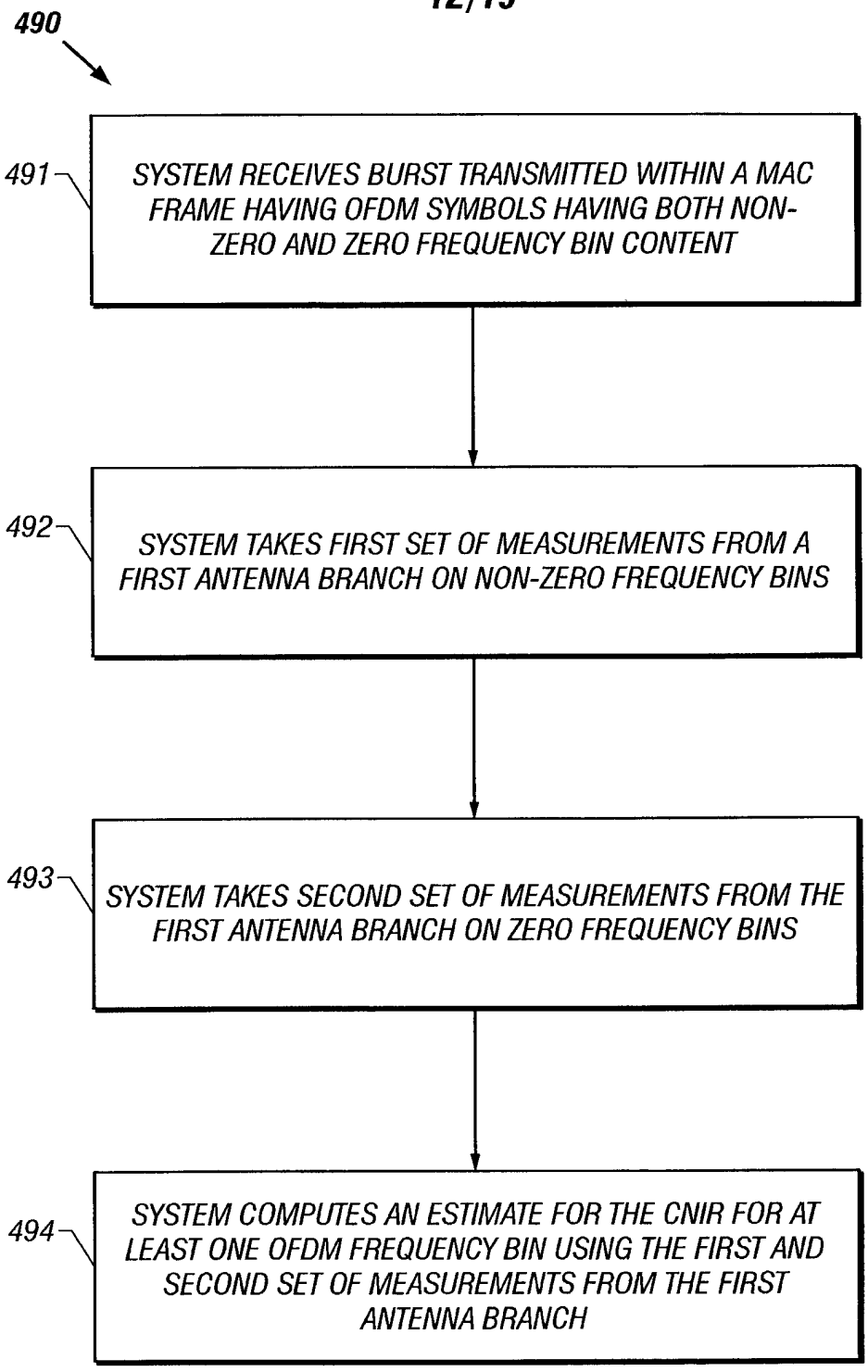
490
491
SYSTEM RECEIVES BURST TRANSMITTED WITHIN A MAC FRAME HAVING OFDM SYMBOLS HAVING BOTH NON-ZERO AND ZERO FREQUENCY BIN CONTENT
492
SYSTEM TAKES FIRST SET OF MEASUREMENTS FROM A FIRST ANTENNA BRANCH ON NON-ZERO FREQUENCY BINS
493
SYSTEM TAKES SECOND SET OF MEASUREMENTS FROM THE FIRST ANTENNA BRANCH ON ZERO FREQUENCY BINS
494
SYSTEM COMPUTES AN ESTIMATE FOR THE CNIR FOR AT LEAST ONE OFDM FREQUENCY BIN USING THE FIRST AND SECOND SET OF MEASUREMENTS FROM THE FIRST ANTENNA BRANCH

FIG. 14

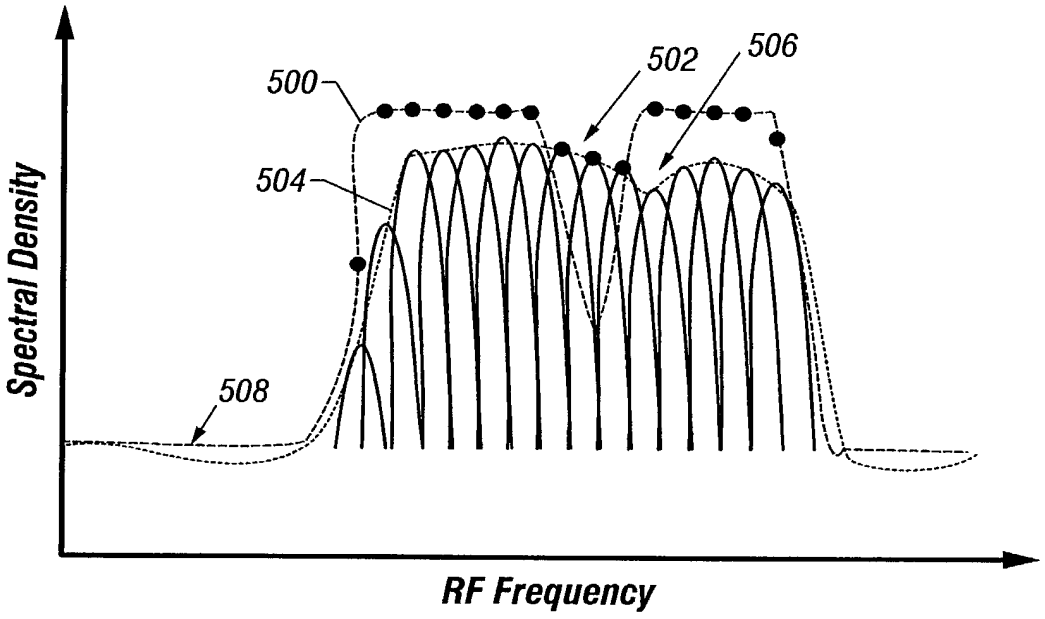

FIG. 15

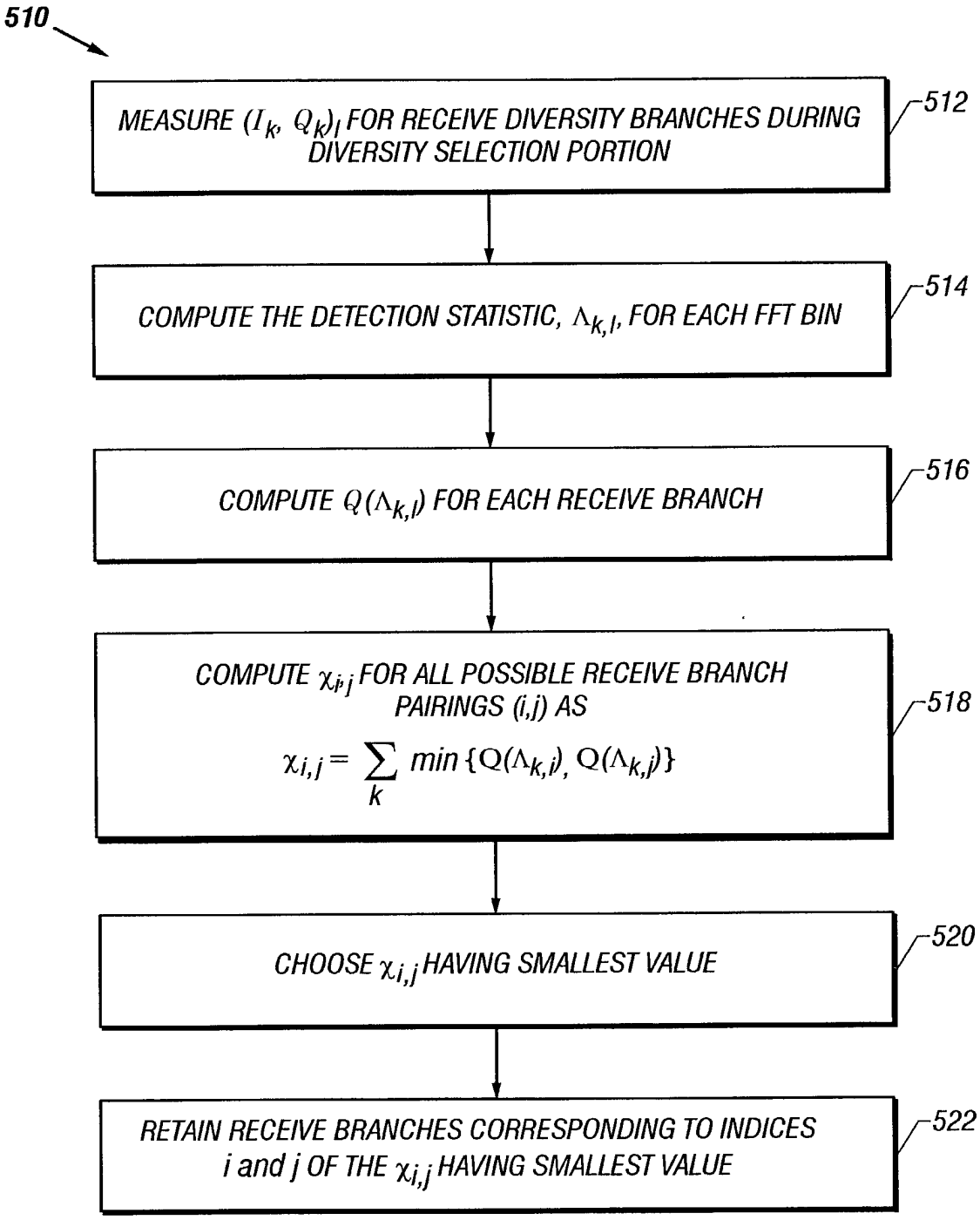
510
MEASURE $(I_k, Q_k)_l$ FOR RECEIVE DIVERSITY BRANCHES DURING DIVERSITY SELECTION PORTION
512
COMPUTE THE DETECTION STATISTIC, $\Lambda_{k,l}$, FOR EACH FFT BIN
514
COMPUTE $Q(\Lambda_{k,l})$ FOR EACH RECEIVE BRANCH
516
COMPUTE $\chi_{i,j}$ FOR ALL POSSIBLE RECEIVE BRANCH PAIRINGS (i,j) AS
$\chi_{i,j} = \sum_k min\{Q(\Lambda_{k,i}), Q(\Lambda_{k,j})\}$
518
CHOOSE $\chi_{i,j}$ HAVING SMALLEST VALUE
520
RETAIN RECEIVE BRANCHES CORRESPONDING TO INDICES i and j OF THE $\chi_{i,j}$ HAVING SMALLEST VALUE
522

FIG. 16

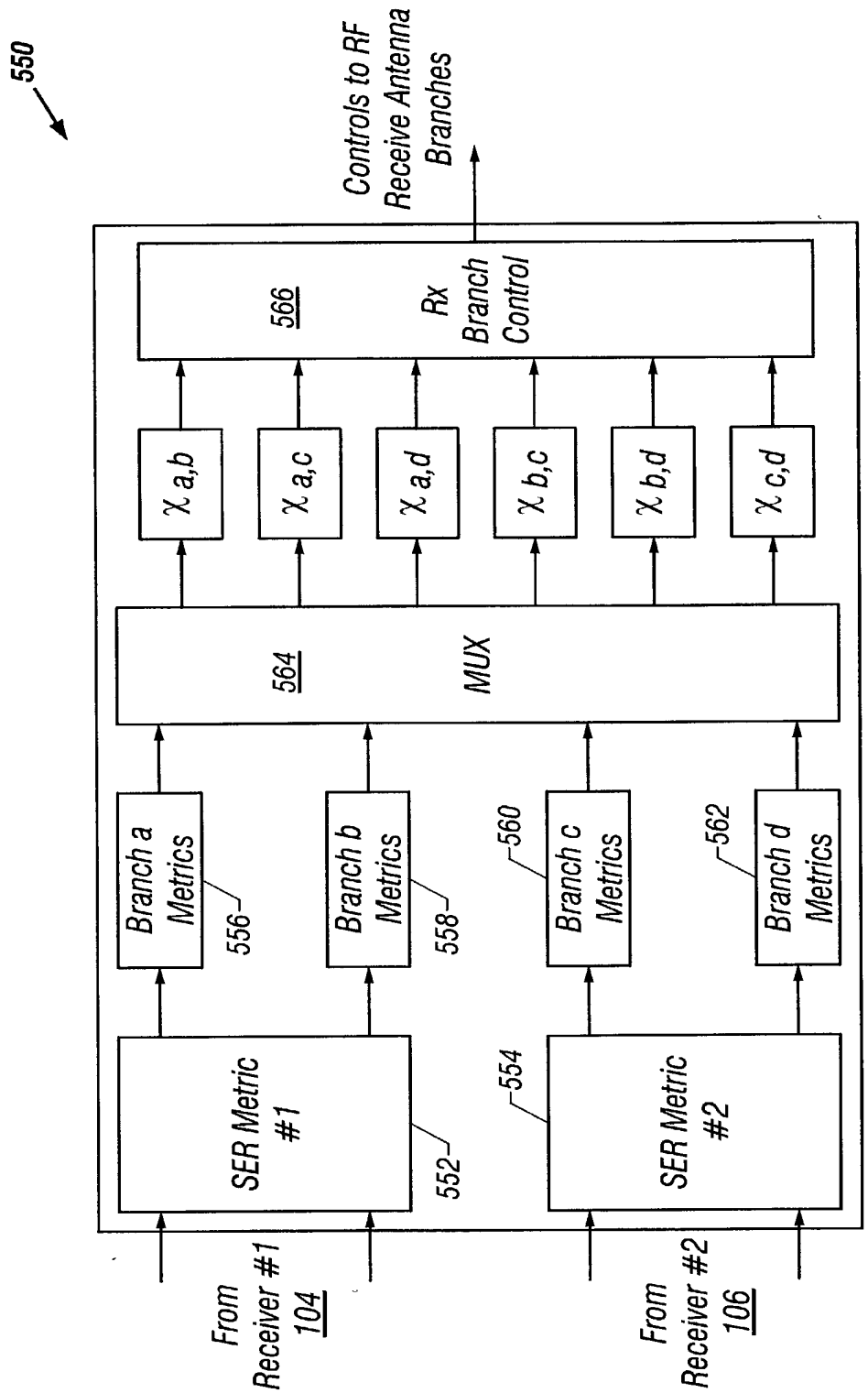
550
Controls to RF Receive Antenna Branches
566
Rx Branch Control
χ a,b
χ a,c
χ a,d
χ b,c
χ b,d
χ c,d
564
MUX
Branch a Metrics
556
Branch b Metrics
558
560
Branch c Metrics
562
Branch d Metrics
SER Metric #1
552
554
SER Metric #2
From Receiver #1 104
From Receiver #2 106

FIG. 17

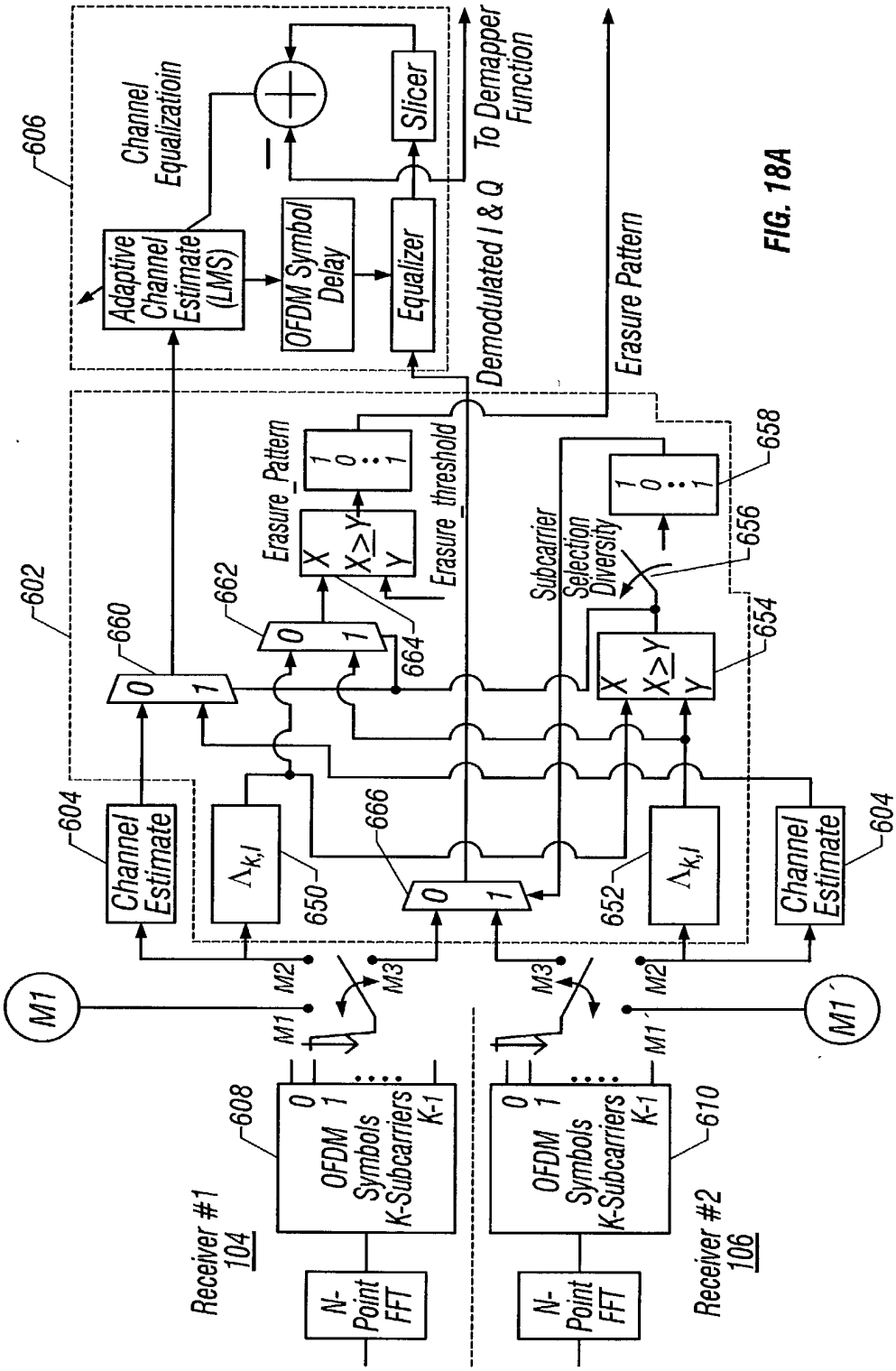
Receiver #1
104
Receiver #2
106
OFDM Symbols K-Subcarriers
N-Point FFT
Channel Estimate
Channel Equalizatioin
Adaptive Channel Estimate (LMS)
OFDM Symbol Delay
Equalizer
Slicer
To Demapper Function
Demodulated I & Q
Erasure Pattern
Erasure_threshold
Subcarrier Selection Diversity
X≥Y
M1
M2
M3
602
604
606
608
610
650
652
654
656
658
660
662
664
666

FIG. 18A

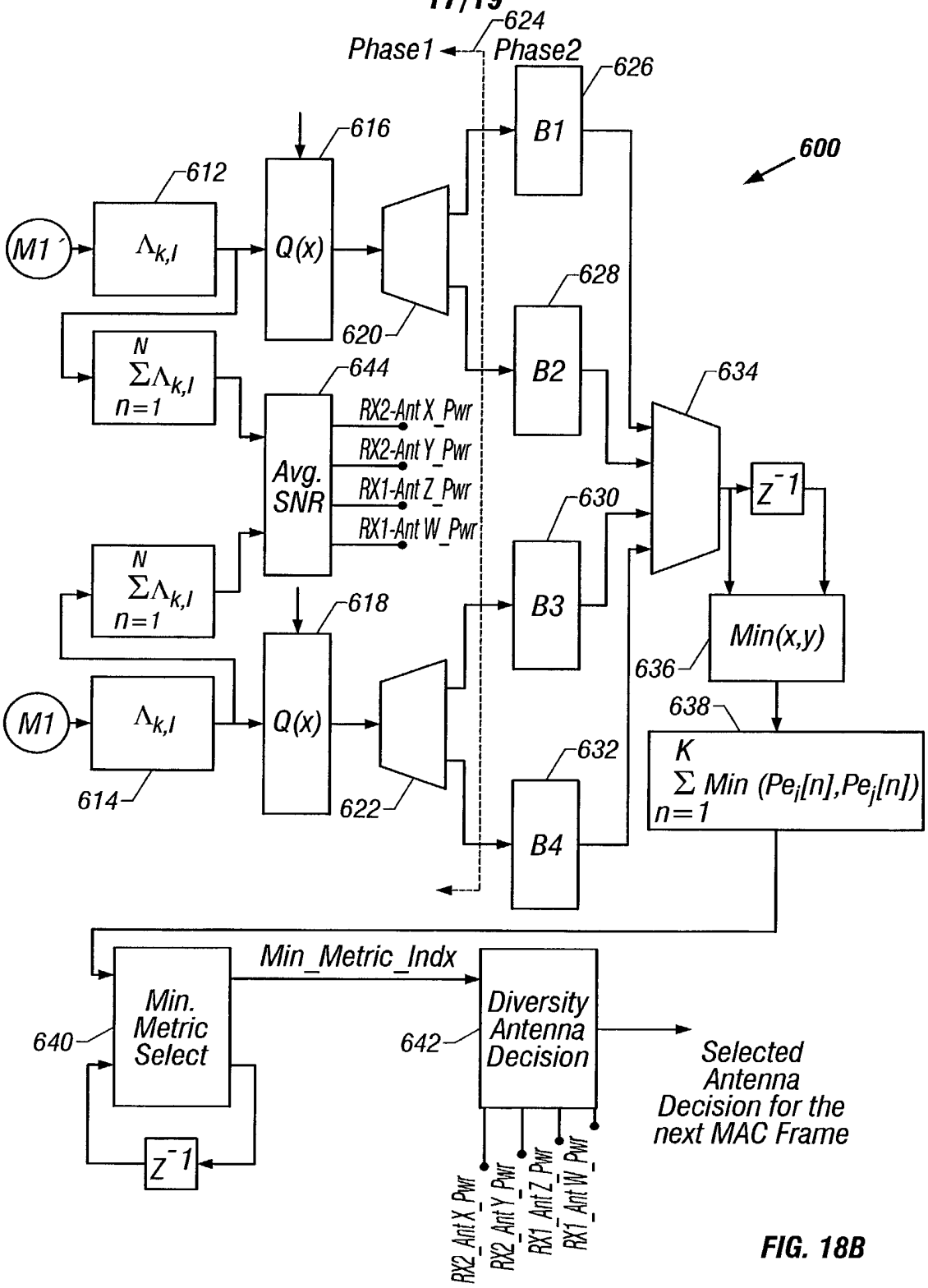
624
Phase1
Phase2
626
B1
600
616
612
M1
$\Lambda_{k,l}$
Q(x)
628
620
B2
$\sum_{n=1}^{N} \Lambda_{k,l}$
644
634
RX2-Ant X_Pwr
RX2-Ant Y_Pwr
RX1-Ant Z_Pwr
RX1-Ant W_Pwr
Avg. SNR
Z^{-1}
630
B3
618
Min(x,y)
636
638
M1
$\Lambda_{k,l}$
Q(x)
614
622
632
B4
K
$\sum_{n=1}^{}$ Min ($Pe_i[n]$,$Pe_j[n]$)
Min_Metric_Indx
Min. Metric Select
640
642
Diversity Antenna Decision
Selected Antenna Decision for the next MAC Frame
Z^{-1}
RX2_Ant X_Pwr
RX2_Ant Y_Pwr
RX1_Ant Z_Pwr
RX1_Ant W_Pwr

FIG. 18B

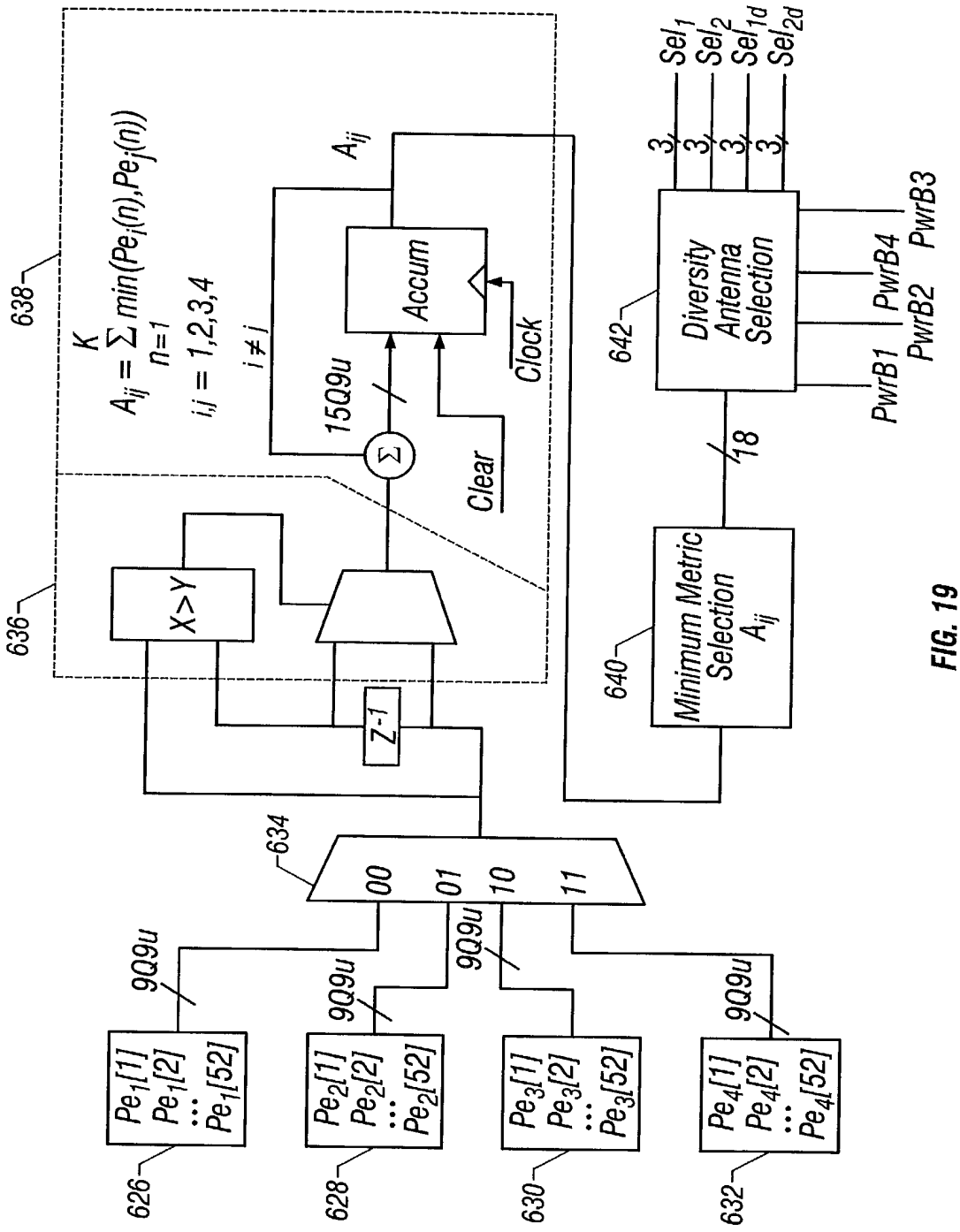
638
$A_{ij} = \sum_{n=1}^{K} \min(Pe_i(n), Pe_j(n))$
$i,j = 1,2,3,4$
$i \neq j$
636
X>Y
15Q9u
Accum
Clock
Clear
A_{ij}
Z^{-1}
634
00
01
10
11
9Q9u
$Pe_1[1]$ $Pe_1[2]$ ... $Pe_1[52]$
$Pe_2[1]$ $Pe_2[2]$ ... $Pe_2[52]$
$Pe_3[1]$ $Pe_3[2]$ ... $Pe_3[52]$
$Pe_4[1]$ $Pe_4[2]$ ... $Pe_4[52]$
626
628
630
632
640
Minimum Metric Selection A_{ij}
18
642
Diversity Antenna Selection
Sel_1 Sel_2 Sel_{1d} Sel_{2d}
3
PwrB1 PwrB2 PwrB4 PwrB3

FIG. 19

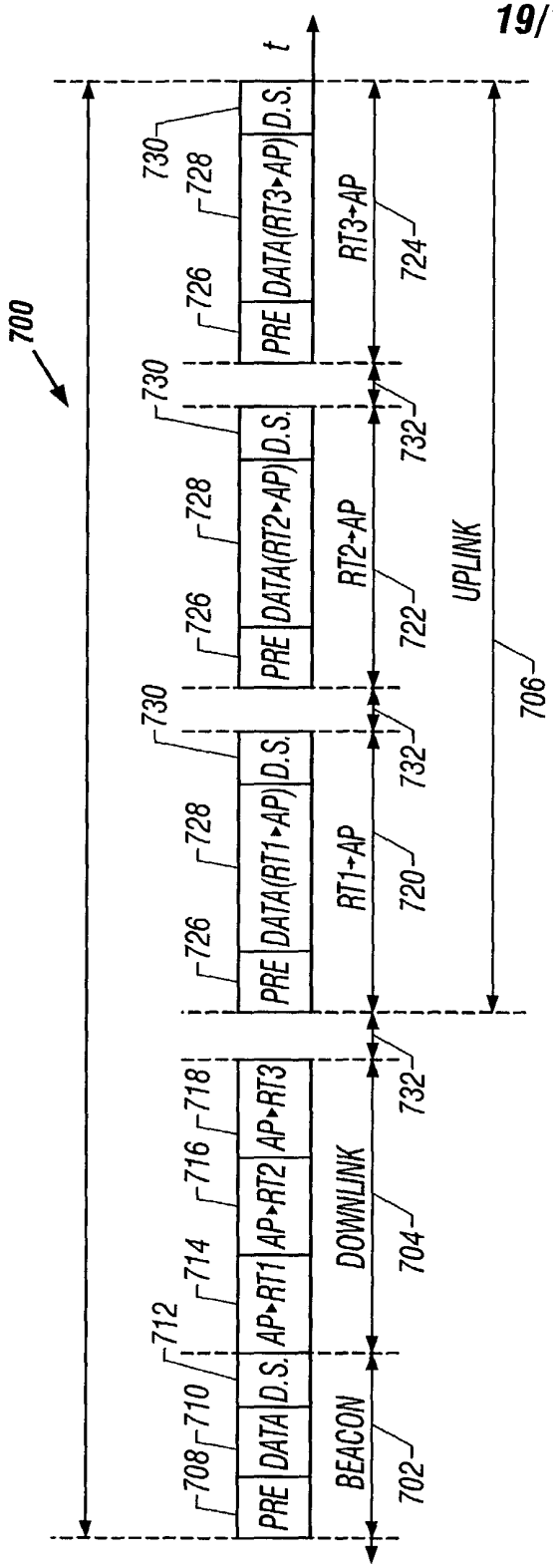
700
t
PRE
DATA
D.S.
AP▸RT1
AP▸RT2
AP▸RT3
BEACON
DOWNLINK
DATA(RT1▸AP)
DATA(RT2▸AP)
DATA(RT3▸AP)
RT1▸AP
RT2▸AP
RT3▸AP
UPLINK
702
704
706
708
710
712
714
716
718
720
722
724
726
728
730
732

FIG. 20

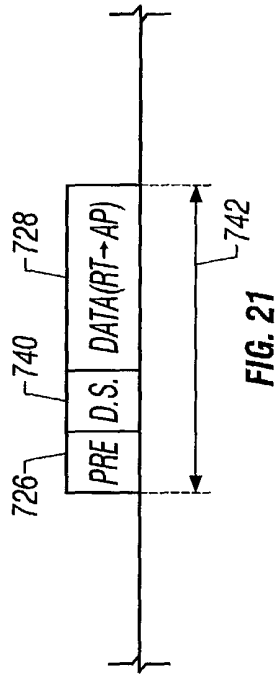
PRE
D.S.
DATA(RT▸AP)
726
728
740
742

FIG. 21